

This week we start with some charts showing the **lack of flexibility** in the gas markets. Before last year we could pull a few different levers to get the gas market back in check if we were severely tight or loose. All these levers were mainly driven by market prices which would either instantaneously impact fundamentals or put the gears in motion to get there soon.

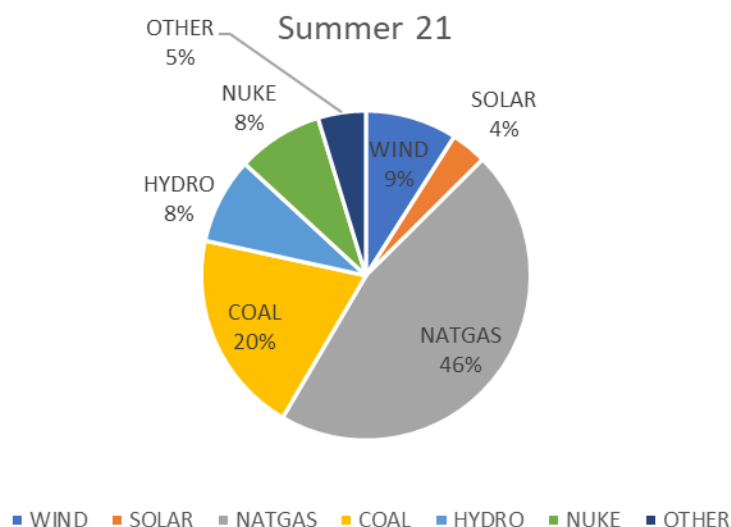
Let's start by looking by listing out the levers:

1) **Supply response:** We have seen supply respond instantaneously in the past when wells in the NE are choked off as cash prices drop to an uneconomical level, but in this case, we are talking about new wells being drilled as prices climb higher. In past years we have seen this new supply lag a price signal by 3-6 months depending on the shale region.

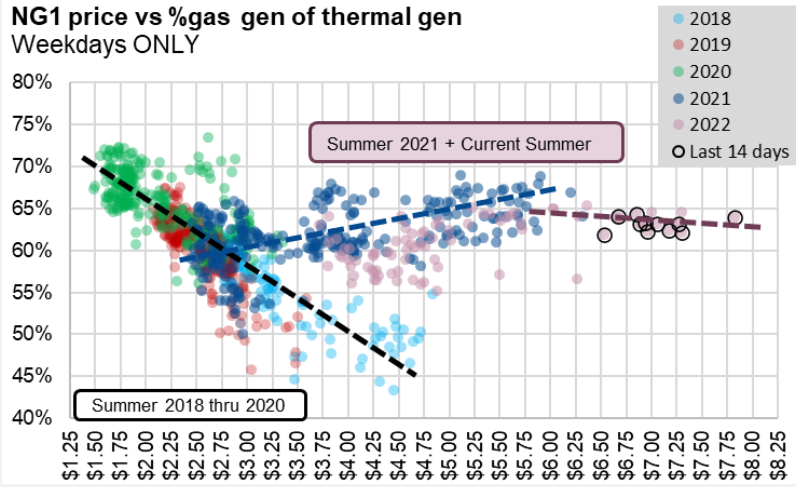
This last year has been quite different. Despite market prices well above production oil/gas break-evens now for some time, we have not seen a strong return of rigs and new wells. The growth has come mostly from DUCs. Producers are not ready to react as they are facing other issues such as tighter capital markets, limits on infrastructure buildout, labor shortages and supply chain constraints (sand, frac crews, equipment) that are inhibiting production growth.

2) **LNG exports:** Technically LNG deliveries should be diverted away from the facilities if local prices are high, but at the moment global LNG arbs are extremely wide - LNG exports are out as a flex feature.

3) **Power market coal to gas switching:** Power markets have traditionally offered natgas markets an almost instantaneous flexibility – not the case now. Since thermal generation (natgas and coal generation) make up over 2/3 of all installed gen capacity, their position in the hourly dispatch curve (which is based on their fuel cost) is very important. The cheapest fuel usually gets called on first (as long as there are no transmission bottlenecks).



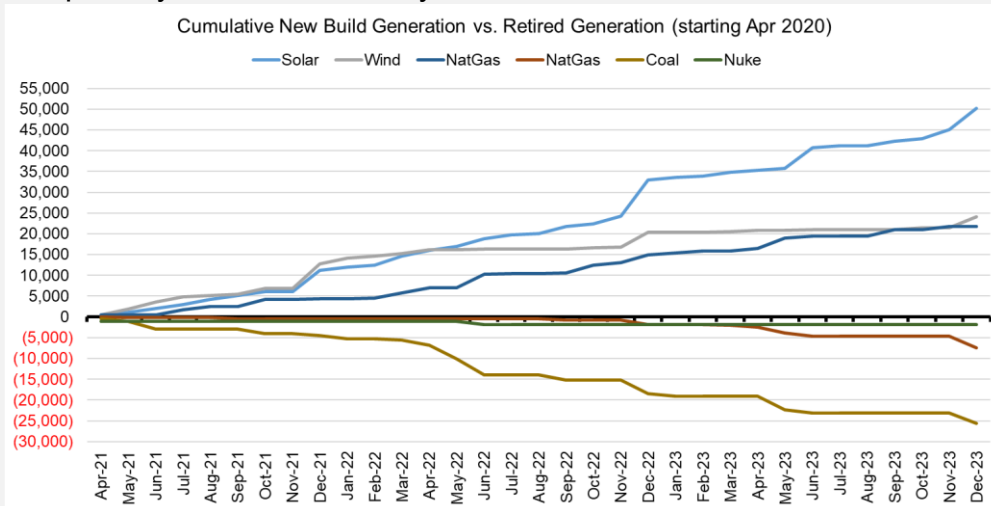
Here is a view showing the natgas generation as a percentage of taking thermal generation vs the prompt month natgas price.



This is not an exact chart of how C2G switching works ISO by ISO, but we get a very clear view that conventionally (before 2020) natgas generation drops as natgas prices increase, i.e. coal becomes the cheaper power source. As of last summer, the dynamic has changed significantly where natgas has consistently held a 60+% market share of thermal generation regardless of how natgas high prices move.

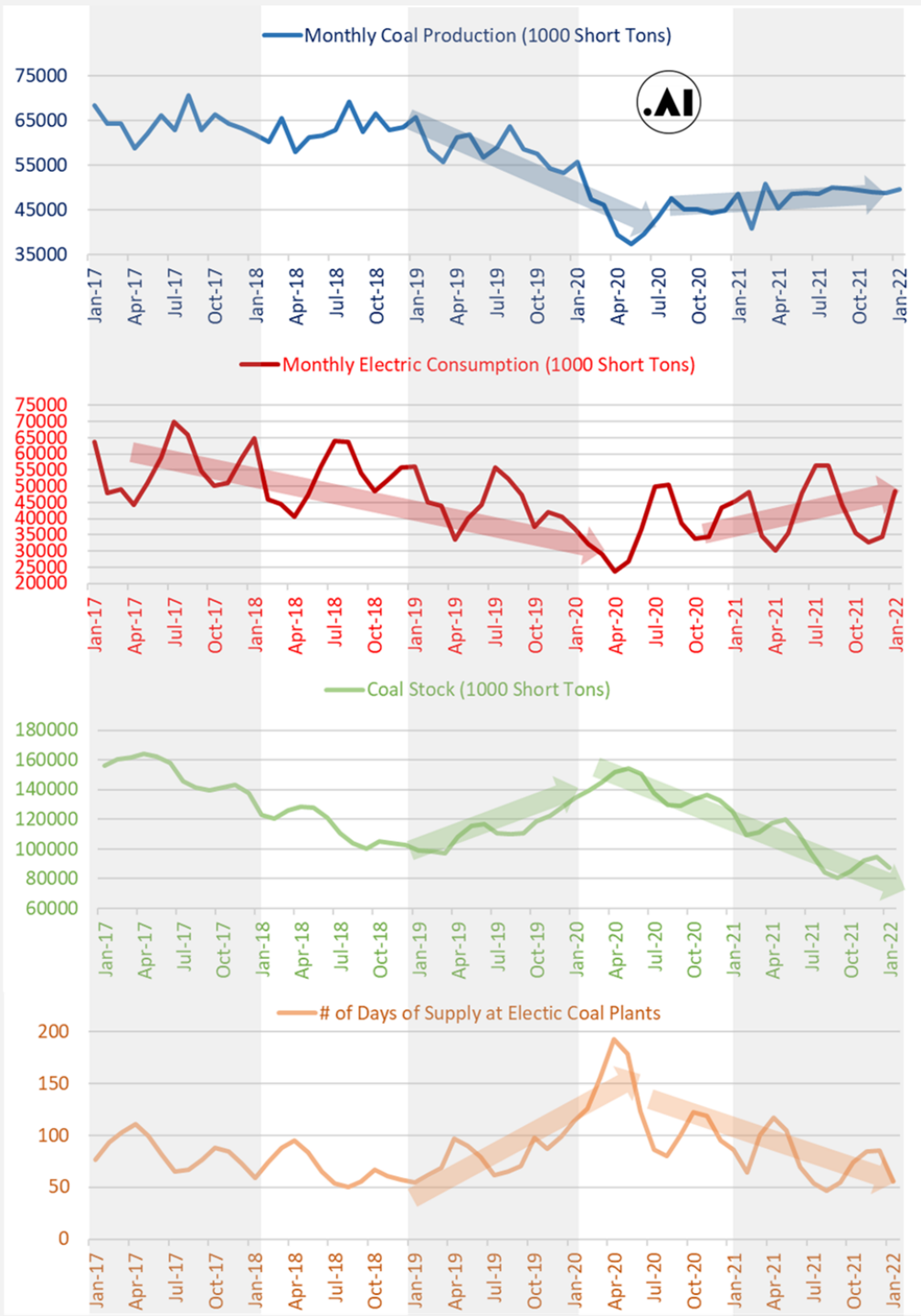
So what's going on? It all has to do with the state of the coal markets.

First, we have lost a considerable amount of coal generation capacity due to decisions that were made in recent years related to environmental reasons, and bad economics of operating coal plants [most likely these decisions were made when coal plant utilization was low with natgas prices below \$3]. The chart below shows expected new and retired capacity by fuel type from the EIA-930 report. This is just the capacity that is officially retired and disregards units that are publicly "active" but barely utilized.



The risk of trading futures and options and other derivatives involves a substantial risk of loss and is not suitable for all persons. Each person must consider whether a particular trade, combination of trades, or strategy is suitable for that person's financial means and objectives. Past results are not necessarily indicative of future results. This communication may contain links to third party websites which are not under the control of and are not maintained by ION Energy Group, and ION Energy Group is not responsible for their content.

Second, the current coal markets are extremely tight with flat-lining production and higher consumption and exports. The net result is low stocks across the country leading to exploding coal prices. The series of charts below gives the full story of how the coal markets ended up in this state.



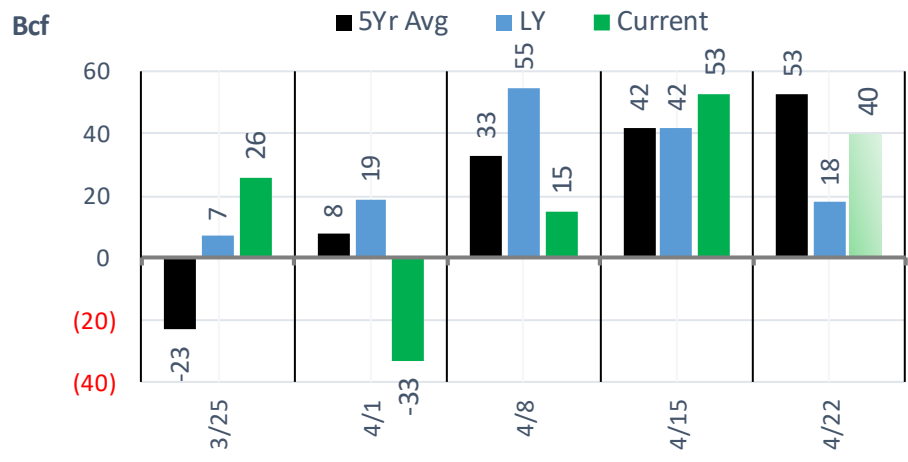
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The latest January data estimates approximately 56 days of supply sitting at coal gen sites, which is a big problem with peak summer still on its way. [In Jan 2020 we had 113 days of supply, and in Jan 2021 we had 86 days of supply.]

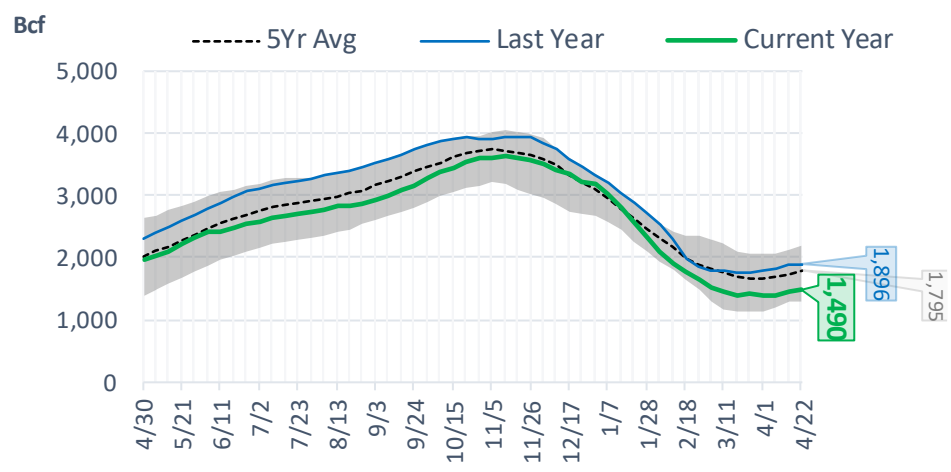
It appears we have minimized or lost C2G switching as a flex feature this summer. This is likely going to be a huge problem if power loads stay elevated and we get the heat that is currently expected.

EIA Storage Report

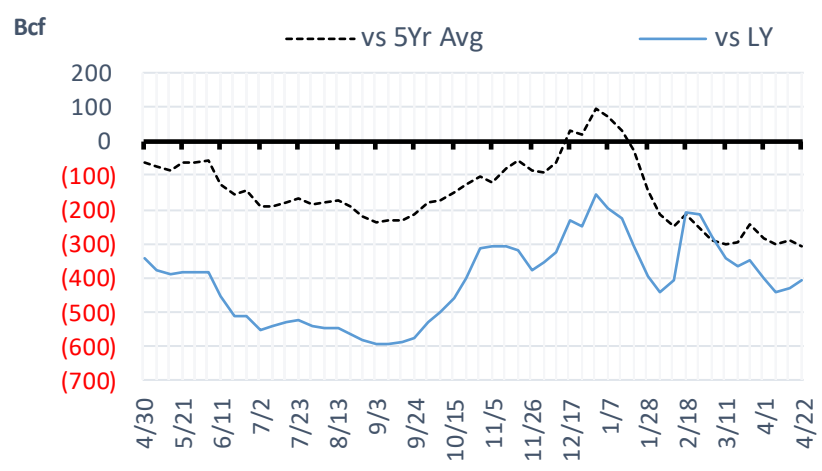
Total Lower 48 YoY Weekly Change



Total Lower 48 Storage Levels



Total Lower 48 LY Surplus/Deficit

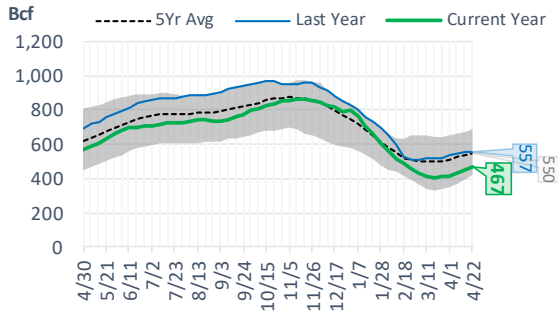


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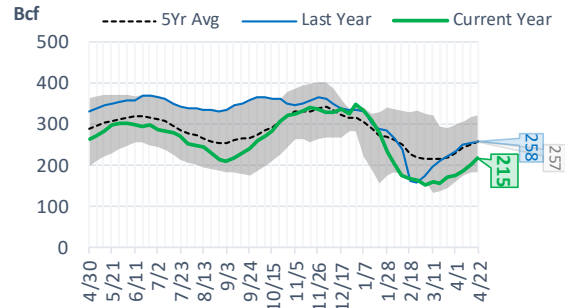
Natural Gas Storage Stats - Last 5 Weeks

Week Ending	Current 22-Apr	Week - 1 15-Apr	Week - 2 8-Apr	Week - 3 1-Apr	Week - 4 25-Mar	Week - 5 18-Mar
Total Lower 48 Storage Level	1490	1450	1397	1382	1415	1389
Weekly Change	+40	+53	+15	-33	+26	-51
vs LY	-406	-428	-439	-399	-347	-366
vs 5Yr Avg	-305	-292	-303	-285	-244	-293
S. Central Salt Storage Level	215	201	186	173	169	156
Weekly Change	+14	+15	+13	+4	+13	-3
vs LY	-43	-54	-63	-61	-55	-56
vs 5Yr Avg	-42	-48	-54	-56	-51	-60
S. Central NonSalt Storage Level	467	449	431	416	412	404
Weekly Change	+18	+18	+15	+4	+8	-8
vs LY	-90	-104	-114	-116	-110	-115
vs 5Yr Avg	-83	-87	-92	-95	-89	-92
Midwest Storage Level	309	304	293	296	317	318
Weekly Change	+5	+11	-3	-21	-1	-19
vs LY	-117	-116	-119	-102	-85	-90
vs 5Yr Avg	-76	-72	-79	-75	-61	-77
East Storage Level	238	238	229	241	268	268
Weekly Change	0	+9	-12	-27	0	-22
vs LY	-82	-85	-81	-64	-39	-42
vs 5Yr Avg	-63	-52	-52	-37	-17	-35
Mountain Storage Level	90	89	90	91	89	87
Weekly Change	+1	-1	-1	+2	+2	0
vs LY	-29	-29	-28	-24	-23	-25
vs 5Yr Avg	-15	-13	-10	-9	-10	-12
Pacific Storage Level	171	169	169	165	161	157
Weekly Change	+2	0	+4	+4	+4	+2
vs LY	-45	-40	-35	-32	-33	-37
vs 5Yr Avg	-26	-21	-16	-15	-14	-16

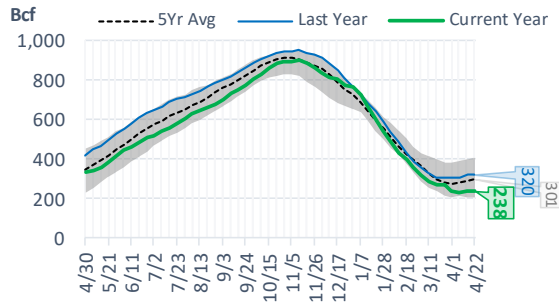
NonSalt Storage Levels



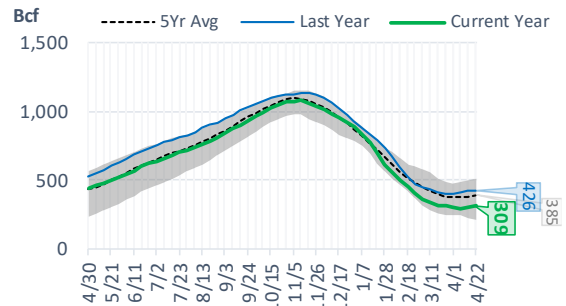
Salt Storage Levels



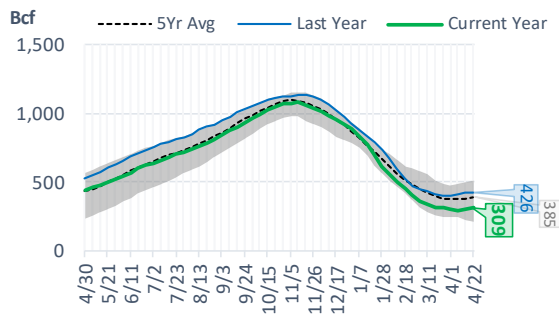
East Storage Levels



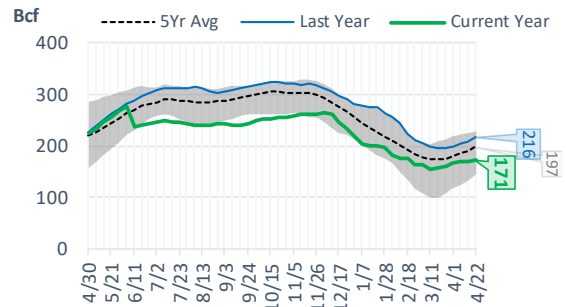
Midwest Storage Levels



Midwest Storage Levels



Pacific Storage Levels



EIA Storage Week Balances

	25-Mar	1-Apr	8-Apr	15-Apr	22-Apr	29-Apr	WoW	vs. 4W
Lower 48 Dry Production	95.4	96.1	95.9	96.4	96.8	96.0	▼ -0.8	▼ -0.3
Canadian Imports	4.8	5.7	5.8	5.6	5.8	6.1	▲ 0.3	▲ 0.4
L48 Power	25.6	26.9	26.7	26.7	26.8	26.7	▼ -0.1	▼ 0.0
L48 Residential & Commercial	23.5	29.7	24.3	21.6	23.3	17.8	▼ -5.5	▼ -6.9
L48 Industrial	20.8	22.5	21.8	20.4	21.0	21.1	▲ 0.1	▼ -0.3
L48 Lease and Plant Fuel	5.2	5.2	5.2	5.3	5.3	5.2	▼ 0.0	▼ 0.0
L48 Pipeline Distribution	2.6	2.9	2.8	2.7	2.8	2.5	▼ -0.3	▼ -0.3
L48 Regional Gas Consumption	77.5	87.3	80.9	76.6	79.1	73.3	▼ -5.8	▼ -7.6
Net LNG Exports	13.0	13.1	12.4	12.5	12.1	12.2	▲ 0.1	▼ -0.3
Total Mexican Exports	6.5	6.4	6.8	6.6	6.7	6.9	▲ 0.2	▲ 0.3
Implied Daily Storage Activity	3.2	-5.0	1.6	6.4	4.7	9.7	5.0	
EIA Reported Daily Storage Activity	3.7	-4.7	2.1	7.6	5.7			
Daily Model Error	-0.5	-0.3	-0.5	-1.2	-1.0			

Monthly Balances

	2Yr Ago Apr-20	LY Apr-21	Dec-21	Jan-22	Feb-22	Mar-22	MTD Apr-22	MoM	vs. LY
Lower 48 Dry Production	92.7	92.5	96.1	93.6	93.6	95.1	96.3	▲ 1.2	▲ 3.8
Canadian Imports	4.0	4.7	4.8	6.7	6.6	5.2	5.8	▲ 0.6	▲ 1.2
L48 Power	25.6	25.0	28.7	31.4	29.0	26.9	26.7	▼ -0.2	▲ 1.7
L48 Residential & Commercial	20.5	19.6	33.9	48.6	42.7	29.6	21.7	▼ -7.8	▲ 2.2
L48 Industrial	20.4	21.4	22.5	25.5	25.3	21.7	21.1	▼ -0.6	▼ -0.3
L48 Lease and Plant Fuel	5.0	5.0	5.3	5.1	5.1	5.2	5.3	▲ 0.1	▲ 0.2
L48 Pipeline Distribution	2.4	2.5	3.2	3.8	3.4	2.9	2.7	▼ -0.3	▲ 0.2
L48 Regional Gas Consumption	74.0	73.5	93.6	114.4	105.5	86.3	77.5	▼ -8.8	▲ 4.0
Net LNG Exports	8.2	11.5	12.1	12.4	12.4	12.9	12.3	▼ -0.6	▲ 0.8
Total Mexican Exports	4.8	6.7	6.2	6.3	6.2	6.5	6.7	▲ 0.2	▲ 0.0
Implied Daily Storage Activity	9.7	5.5	-11.0	-32.8	-23.8	-5.4	5.6		
EIA Reported Daily Storage Activity									
Daily Model Error									

Source: Bloomberg, analytix.ai

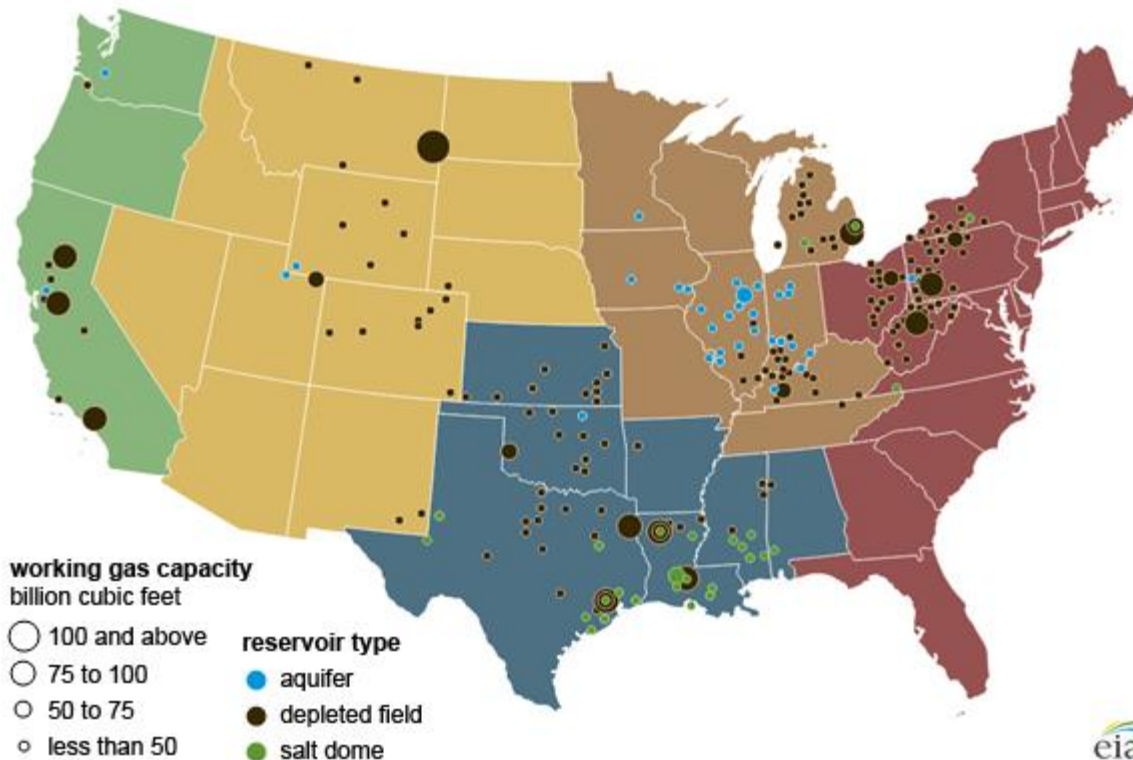
Regional S/D Models Storage Projection

Week Ending 29-Apr

	Daily Raw Storage	Daily Adjustment Factor	Daily Average Storage Activity (Adjusted) *	Weekly Adjusted Storage Activity
L48	10.2	0.3	10.6	74
East	1.0	1.5	2.5	18
Midwest	2.5	-0.5	2.0	14
Mountain	4.1	-3.5	0.6	4
South Central	2.4	2.4	4.8	34
Pacific	0.3	0.4	0.6	4

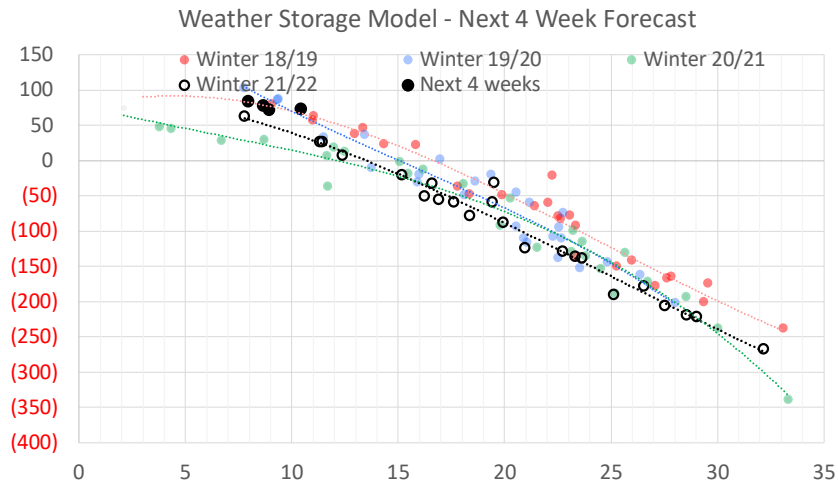
*Adjustment Factor is calculated based on historical regional deltas

U.S. underground natural gas storage facilities by type (July 2015)



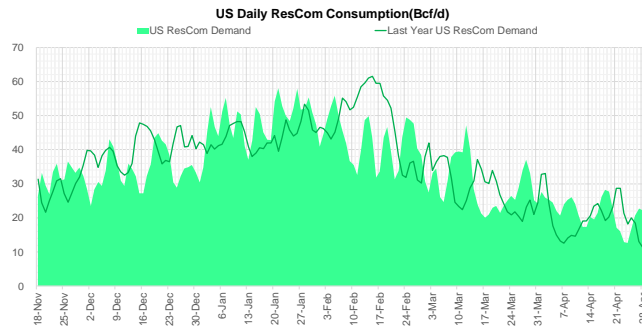
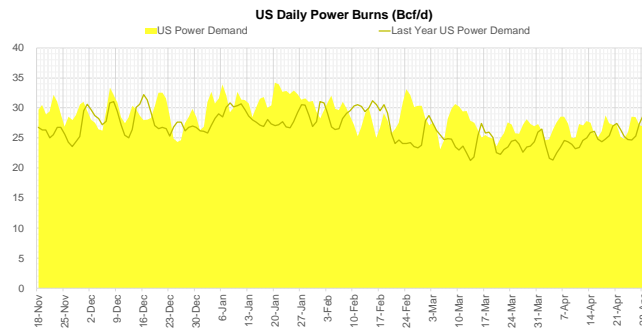
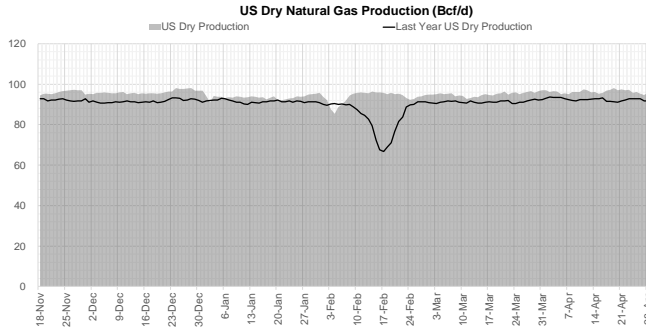
Weather Model Storage Projection

Next report and beyond		
Week Ending	TDDs	Week Storage Projection
29-Apr	10.4	74
06-May	8.9	73
13-May	8.6	79
20-May	7.9	84



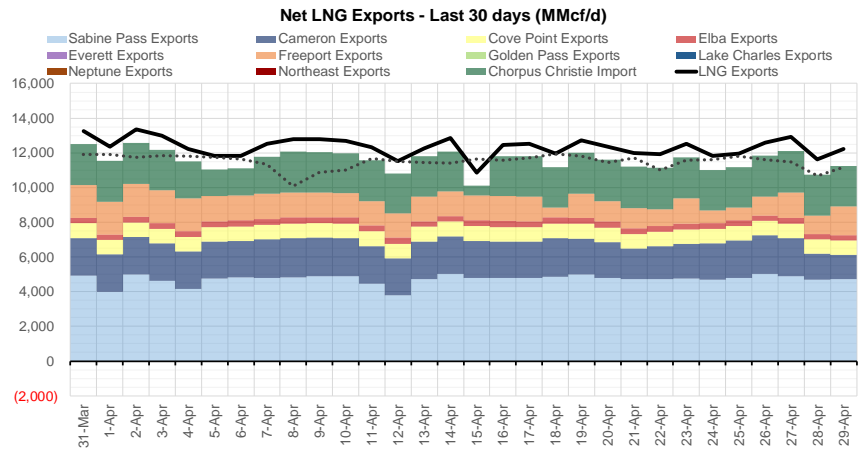
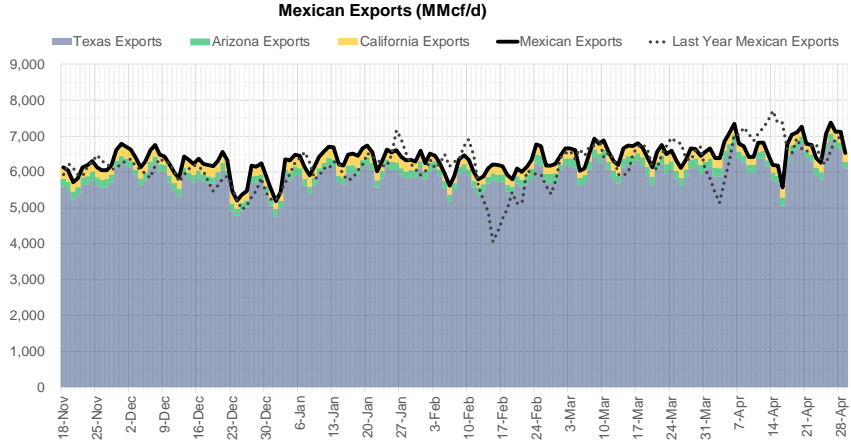
Note: this is not our official end of season forecast. This chart signifies where storage levels end with 10-year normal weather and current market tightness relative to last year

Supply – Demand Trends



Source: Bloomberg

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Source: Bloomberg

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Nat Gas Options Volume and Open Interest CME and ICE data combined

CONTRACT MONTH	CONTRACT YEAR	PUT/CALL	STRIKE	CUMULATIVE VOL	CONTRACT MONTH	CONTRACT YEAR	PUT/CALL	STRIKE	CUMULATIVE OI
6	2022	P	6.00	6042	8	2022	C	10.00	50562
6	2022	C	8.00	3649	8	2022	C	10.50	44276
6	2022	P	5.75	3628	10	2022	C	6.00	34934
6	2022	P	5.50	3520	6	2022	C	6.00	25600
6	2022	C	9.00	3452	10	2022	C	5.00	25550
1	2023	C	50.00	3100	9	2022	C	6.00	23730
2	2023	C	50.00	3000	10	2022	P	3.00	21580
3	2023	C	50.00	3000	7	2022	C	8.00	21007
10	2023	P	2.00	3000	6	2022	P	4.00	20133
9	2022	C	11.00	2831	8	2022	C	6.00	19666
7	2022	P	5.75	2651	6	2022	C	7.00	19499
9	2022	C	12.00	2580	7	2022	C	6.00	19108
3	2023	P	2.75	2500	12	2022	C	5.00	18421
2	2023	C	8.00	2155	10	2022	P	3.50	18141
6	2022	P	4.75	2003	8	2022	C	7.00	18023
8	2022	C	10.00	1830	9	2022	C	7.00	17920
10	2022	P	3.50	1775	9	2022	C	10.00	17888
6	2022	C	7.50	1757	6	2022	C	5.00	17862
6	2022	C	10.00	1530	7	2022	C	7.00	17772
6	2022	C	7.00	1413	7	2022	P	3.25	17645
10	2022	C	10.00	1277	10	2022	P	2.50	17436
8	2022	C	8.00	1264	6	2022	P	3.00	17223
10	2022	P	3.00	1250	7	2022	C	10.00	17061
10	2022	C	15.00	1244	6	2022	C	10.00	16918
3	2023	C	20.00	1200	6	2022	P	5.50	16673
6	2022	C	8.50	1188	10	2022	P	4.00	16525
6	2022	C	9.50	1156	6	2022	P	4.75	16016
3	2023	C	10.00	1155	6	2022	P	3.50	15977
8	2022	P	5.00	1150	1	2023	C	10.00	15635
9	2022	C	10.00	1147	2	2023	C	10.00	15474
7	2022	C	9.00	1122	7	2022	P	5.00	15336
3	2023	C	9.00	1100	9	2022	P	2.50	15291
10	2022	P	6.00	1050	7	2022	P	3.50	14935
6	2022	P	6.50	1045	9	2022	P	2.75	14933
10	2022	C	7.00	1000	6	2022	C	9.00	14917
10	2022	P	4.00	1000	10	2022	P	2.00	14764
3	2023	P	3.50	1000	7	2022	P	3.00	14500
7	2022	C	9.25	985	8	2022	P	3.00	14450
6	2022	P	5.00	959	11	2022	P	4.00	14392
8	2022	C	10.50	898	9	2022	P	3.00	14341
3	2023	C	7.00	887	6	2022	P	3.75	14279
2	2023	C	20.00	880	10	2022	P	3.25	14249
6	2022	C	12.00	839	6	2022	P	6.00	14116
10	2022	P	5.50	834	10	2022	P	6.00	13957
7	2022	C	8.50	822	12	2022	C	6.00	13951
6	2022	P	7.00	814	10	2022	C	7.00	13879
12	2022	P	6.25	800	7	2022	P	4.00	13623
1	2023	C	20.00	800	6	2022	P	4.50	13567
10	2022	C	12.00	725	4	2023	C	5.00	13530
					6	2022	C	3	13438

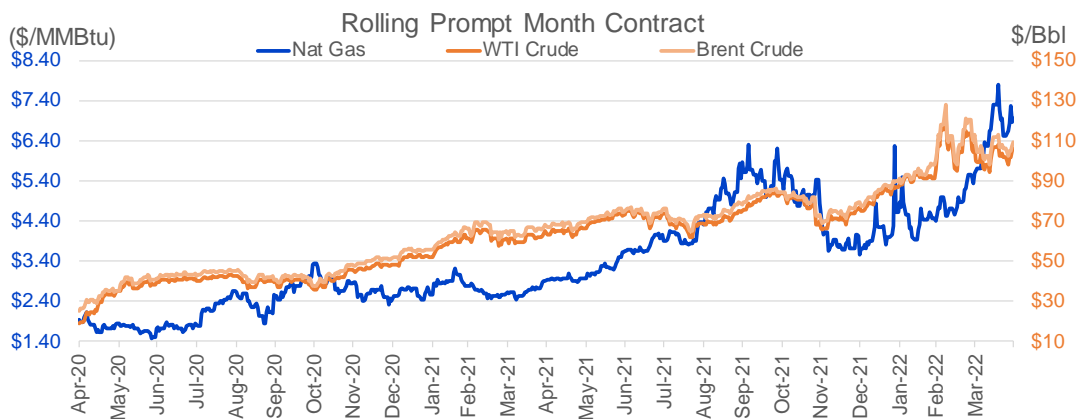
Source: CME, ICE

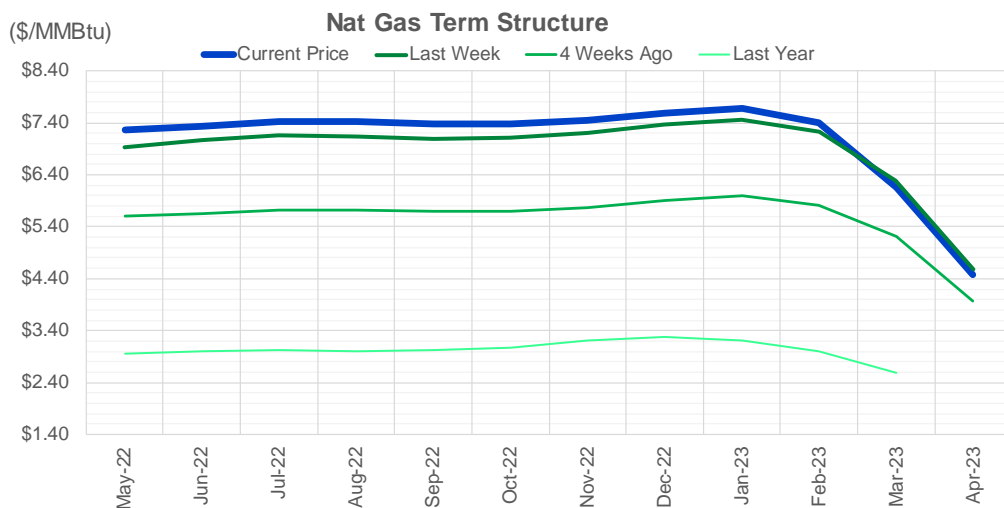
Nat Gas Futures Open Interest

CME and ICE data combined

CME Henry Hub Futures (10,000 MMBtu)				ICE Henry Hub Futures Contract Equivalent (10,000 MM			
	Current	Prior	Daily Change		Current	Prior	Daily Change
JUN 22	129734	355	129379	JUN 22	80506	81576	-1070
JUL 22	162760	131950	30810	JUL 22	75148	80910	-5762
AUG 22	63918	162475	-98557	AUG 22	62079	76420	-14341
SEP 22	88020	62776	25244	SEP 22	66457	62200	4257
OCT 22	94537	86820	7717	OCT 22	75355	66266	9090
NOV 22	45703	94341	-48638	NOV 22	57730	76327	-18597
DEC 22	46604	46217	387	DEC 22	61313	57525	3789
JAN 23	62242	46658	15584	JAN 23	64203	61395	2807
FEB 23	24432	61649	-37217	FEB 23	52157	64125	-11968
MAR 23	38066	23909	14157	MAR 23	54051	52047	2004
APR 23	57486	38794	18692	APR 23	51725	53491	-1767
MAY 23	58974	56850	2124	MAY 23	47560	51724	-4164
JUN 23	23229	58278	-35049	JUN 23	43403	47576	-4173
JUL 23	18984	22809	-3825	JUL 23	42796	43418	-622
AUG 23	14079	18757	-4678	AUG 23	42788	42812	-24
SEP 23	18012	14000	4012	SEP 23	42711	42765	-54
OCT 23	33199	18090	15109	OCT 23	48902	42688	6214
NOV 23	12356	33419	-21063	NOV 23	42953	48834	-5881
DEC 23	13949	12295	1654	DEC 23	39337	42859	-3522
JAN 24	21692	14047	7645	JAN 24	37542	39055	-1513
FEB 24	5802	21768	-15966	FEB 24	25431	37364	-11932
MAR 24	14710	5745	8965	MAR 24	30922	25343	5580
APR 24	10758	14494	-3736	APR 24	24870	30064	-5194
MAY 24	6412	10820	-4408	MAY 24	25183	24712	470
JUN 24	1860	6438	-4578	JUN 24	21611	25020	-3409
JUL 24	1937	1858	79	JUL 24	22027	21476	551
AUG 24	3140	1933	1207	AUG 24	22244	21888	357
SEP 24	1419	3136	-1717	SEP 24	21331	22855	-1524
OCT 24	6625	1421	5204	OCT 24	23206	21196	2010
NOV 24	4816	6608	-1792	NOV 24	22066	23085	-1019

Source: CME, ICE






	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23
Current Price	\$7.267	\$7.339	\$7.436	\$7.435	\$7.385	\$7.387	\$7.456	\$7.589	\$7.692	\$7.405	\$6.165	\$4.470
Last Week	\$6.937	\$7.065	\$7.158	\$7.151	\$7.102	\$7.112	\$7.198	\$7.365	\$7.469	\$7.225	\$6.278	\$4.585
vs. Last Week	\$0.330	\$0.274	\$0.278	\$0.284	\$0.283	\$0.275	\$0.258	\$0.224	\$0.223	\$0.180	-\$0.113	-\$0.115
4 Weeks Ago	\$5.605	\$5.658	\$5.714	\$5.717	\$5.695	\$5.702	\$5.766	\$5.903	\$5.992	\$5.808	\$5.204	\$3.970
vs. 4 Weeks Ago	\$1.662	\$1.681	\$1.722	\$1.718	\$1.690	\$1.685	\$1.690	\$1.686	\$1.700	\$1.597	\$0.961	\$0.500
Last Year	\$2.925	\$2.960	\$3.011	\$3.025	\$3.007	\$3.019	\$3.080	\$3.203	\$3.282	\$3.203	\$2.990	\$2.578
vs. Last Year	\$4.342	\$4.379	\$4.425	\$4.410	\$4.378	\$4.368	\$4.376	\$4.386	\$4.410	\$4.202	\$3.175	\$1.892

	Units	Current Price	vs. Last Week	vs. 4 Weeks Ago	vs. Last Year
NatGas Jul21/Oct21	\$/MMBtu	2.224	▲ 0.000	▲ 0.000	▲ 2.214
NatGas Oct21/Nov21	\$/MMBtu	0.361	▲ 0.000	▲ 0.000	▲ 0.298
NatGas Oct21/Jan22	\$/MMBtu	-1.817	▲ 0.000	▲ 0.000	▼ -2.094
NatGas Apr22/Oct22	\$/MMBtu	1.623	▼ -0.196	▲ 1.219	▲ 1.598
WTI Crude	\$/Bbl	105.36	▲ 1.570	▲ 5.080	▲ 40.350
Brent Crude	\$/Bbl	107.59	▼ -0.740	▼ -0.320	▲ 39.030
Fuel Oil, NY Harbour 1%	\$/Bbl	97.18	▲ 0.000	▲ 0.000	▲ 0.000
Heating Oil	cents/Gallon	513.54	▲ 123.460	▲ 144.420	▲ 317.400
Propane, Mt. Bel	cents/Gallon	1.31	▼ -0.014	▼ -0.130	▲ 0.490
Ethane, Mt. Bel	cents/Gallon	0.51	▲ 0.003	▲ 0.081	▲ 0.271
Coal, PRB	\$/MTon	12.30	▲ 0.000	▲ 0.000	▲ 0.000
Coal, PRB	\$/MMBtu	0.70			

Source: CME, Bloomberg

Baker Hughes Rig Counts

Rotary Rig Count						Baker Hughes 
4/29/2022						
U.S. Breakout Information	This Week	+/-	Last Week	+/-	Year Ago	
Oil	552	3	549	210	342	
Gas	144	0	144	48	96	
Miscellaneous	2	0	2	0	2	
Directional	30	-1	31	7	23	
Horizontal	643	4	639	245	398	
Vertical	25	0	25	6	19	
Canada Breakout	This Week	+/-	Last Week	+/-	Year Ago	
Oil	45	-3	48	25	20	
Gas	50	-3	53	19	31	
Major Basin Variances	This Week	+/-	Last Week	+/-	Year Ago	
Ardmore Woodford	2	0	2	2	0	
Arkoma Woodford	2	0	2	2	0	
Barnett	4	0	4	3	1	
Cana Woodford	26	-1	27	14	12	
DJ-Niobrara	15	0	15	8	7	
Eagle Ford	61	0	61	27	34	
Granite Wash	4	0	4	1	3	
Haynesville	67	0	67	22	45	
Marcellus	37	0	37	8	29	
Mississippian	1	0	1	1	0	
Permian	335	1	334	111	224	
Utica	12	0	12	2	10	
Williston	37	1	36	22	15	